

**REMARKS**

Claims 1-21 are pending in this application. Claims 16-19 were presented in the response filed December 17, 2007, while claims 20 and 21 were added in an amendment filed August 15, 2008. Claim 8 has been amended to reinsert “wherein” and to change the term “comprising” to “comprises”. Claims 6 and 16 have been amended to delete “anti-protozoal” drug because it is antiparasitic. Claims 18 and 19 have been amended to make it clear that the ophthalmic drug types “non-steroidal anti inflammatory” and “antibiotic” are drugs.

**New Matter Issue Raised in Advisory Action**

In the Advisory Action dated October 9, 2008, the Examiner held that the proposed Amendment filed August 15, 2008 raised “the issue of new matter.” The Examiner’s note with respect to this issue is that the added subject matter requires the Examiner to determine “whether or not the new limitations are supported by the instant specification....” In the amendment submitted after final, Applicant explained support for the subject matter added to the claims and believes that no new matter has been added. Claims 1-7, 11, 12, and 18 were previously amended in the amendment filed August 15, 2008. Support for the amendments are set forth below.

Claim 1 was amended to add: “with an encapsulation material, wherein said encapsulation material is selected dependent upon ophthalmic drug characteristics wherein a hydrophobic encapsulation material is selected for a hydrophobic ophthalmic drug and a hydrophilic encapsulation material is selected for a hydrophilic ophthalmic drug; and wherein said ophthalmic drug”. Support for this limitation can be found in the specification at page 8, lines 15-16; page 9, line 1; page 10, lines 15-20; and page 15, line 7 to page 16, line 4.

Claim 2 was amended to limit the size of the nanoparticle to “less than 200 nm.” Support for this limitation can be found in the specification at page 7, line 9.

Claim 3 was amended to recite: “wherein said nanoparticles are dispersed within said contact lens in an amount such that said contact lens remains optically transparent, wherein optically transparent is a degree of transparency equal to that of p-HEMA or other material employed as a contact lens.” Support for this limitation can be found in the specification at page 7, lines 3-17.

Claim 4 was amended to recite that the contact lens comprises poly 2-hydroxyethylmethacrylate” and that the “the transmittance of visible light through said contact lens is at least 66%.” Support for these limitations can be found in the specification at page 7, lines 9-10; page 16, lines 5-22; page 17, line 12 to page 18, line 19; and page 22, line 16.

Claim 5 was amended to recite that “the hydrophilic encapsulation material is a liposome.” Support for this limitation can be found in the specification at page 9, line 1 and page 10, lines 19-20.

Claims 6 and 18 were amended to change non-steroidal ophthalmic drug to an anti-inflammatory non-steroidal drug. Support for this limitation can be found in original claim 6.

Claim 7 was amended to recite hydrophobic encapsulation material set forth in claim 1 is a microemulsion. Support for this limitation can be found in the specification at page 8, lines 12-19.

Claim 8 was amended to clarify the encapsulation material by its composition and to delete terms such as “nanoparticles,” “particles” and “nanosized ...particles.” Support for this the amendment to claim 8 can be found at page 9, line 3 to page 10, line 9. While some of the

encapsulation types are identified as, the encapsulation material, i.e. the chemical compound forming the “nanoparticles,” “particles” and “nanosized ... particles,” are disclosed. It is not necessary to limit the encapsulating material by his physical type. For this reason, the physical limitations for the enapsulating material had been deleted.

### **Rejections over Resnick**

Claim 1, 2, 4, 5, 9, 12, and 13 stand under 35 U.S.C. 102(e) as being anticipated by Resnick (U.S. Published Application 2002/0141760 A1). In addition, claims 10, 11, 14 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Resnick alone; claims 6 and 17-19 stand rejected under 35 USC 103(a) as being unpatentable over Resnick in view of Darougar et al. (Patent No. 6,264,971) [hereinafter Darougar], and claims 6 and 16 stand rejected under 35 USC 103(a) as being unpatentable over Resnick in view of Raut (U.S. Published Application 2003/0216431).

“A rejection for anticipation under section 102 requires that each and every limitation of the claimed invention be disclosed in a single prior art reference.” *In re Paulsen*, 30 F.3d 1475, 1478-79 (Fed. Cir. 1994); *see Karsten Manufacturing Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001) (“Invalidity on the ground of ‘anticipation’ requires lack of novelty of the invention as claimed. . . . that is, all of the elements and limitations of the claim must be shown in a single prior reference, arranged as in the claim”).

Claim 1 is directed to a drug delivery system. The claim requires the following elements: (i) a contact lens, (ii) nanoparticles dispersed within the contact lens, (iii) an ophthalmic drug encapsulated in the nanoparticles, (iv) the encapsulation material for the nanoparticles is selected dependent upon ophthalmic drug characteristics wherein a hydrophobic encapsulation material is

selected for a hydrophobic ophthalmic drug and a hydrophilic encapsulation material is selected for a hydrophilic ophthalmic drug, (v) the encapsulation must be a material from which said ophthalmic drug is capable of being diffused into and migrate through said contact lens into a post-lens tear film when said contact lens is placed on the eye, and (vi) diffusion provides extended or time-release delivery of said ophthalmic drug.

Resnick states that his invention “relates to a means, method and manufacture of a contact lenses [sic, lens] designed to be worn on the user’s eye for the purpose of providing protection from the effects of repeated exposure to optical stimulation of the optic nerves and central nervous system, or brain, as the result of repeated exposure to flashes or radiant light commonly associated with the strobe flashes produced by cameras, or by exposure to radiation from other sources, such as the Sun, or from next-generation LASER or spectral energy weapons, or any type of electromotive force weaponry, by providing an incorporating, singularly or in combination, both methods of reflective means and/or adsorptive means utilizing Radar-Attenuating Material (“RAM”), such as Molybdenum Disulfide (“MOS2 [sic, MoS<sub>2</sub>]”), or other discrete microelectronic devices, such as electromotive force (“EMF”) counter counter-measure devices, in order to protect the wearer from suffering injuries or harm as a result of exposure to such occurrences” (¶ [0003]). According to Resnick, the invention “is enabled through alteration and improvement of conventional contact lenses by incorporation of the microspheres or nanospheres into the actual lens during manufacture through fabrication of a new shaped matrix incorporation microspheres (including nanospheres) containing reflective or adsorptive substances, or by application of a coating comprising substrate, carrier microspheres, binder and chemicals, in a matrix or comprising layers of coating comprising a matrix, or comprising a

series of matrixes, to be applied as a coating to existing lenses or new manufactures, or alternately to both” (*ibid*). The lenses described by Resnick comprise “typical permeable, semi-permeable, or gaspermeable (breathable), or convention glass, or hard contact eye lenses as taught in U.S. Pat. Nos. 5,891,932 [Benz et al.] or 4,865,439 [Neefe]” (¶ [0004]). In the rejection, the Examiner relies on these patents as teaching “soft contact lenses and incorporation of 2-hydroxyethyl-methacrylate as well as their storage in saline solution.”

Resnick does not anticipate claim 1. The reference does not disclose an ophthalmic drug encapsulated in nanoparticles embedded in the contact lens. Resnick discloses encapsulating reflective or radiant energy adsorptive materials in the nanoparticles. The encapsulated materials disclosed by Resnick are MoS<sub>2</sub>, silver oxide, chromic oxide and ferric oxide (¶¶ [0007], [0010] and [0015]). All of these compounds are harmful to the eye if allowed to diffuse out of the nanospheres or microspheres into the post-lens tear film of the eye, an element required by claim 1. The MSDS’s for MoS<sub>2</sub>, silver oxide, chromic oxide and ferric oxide show that eye contact with these compounds should be avoided. Copies of the MSDS’s for these compounds are attached to this response. Therefore, MoS<sub>2</sub>, silver oxide, chromic oxide and ferric oxide would not be regarded as ophthalmic drugs by a person skilled in the art. Accordingly, Resnick does not does not disclose an ophthalmic drug encapsulated in nanoparticles embedded in the contact lens as required by claim 1.

Further, the reference does not disclose, let alone suggest, nanoencapsules made of a material from which said ophthalmic drug is capable of diffusion into and migration through said contact lens into a post-lens tear film when said contact lens is placed on the eye. As set forth, *supra*, Resnick does not disclose an encapsulating ophthalmic drug, but a reflective or adsorptive

material to reflect or adsorb harmful radiation. Because of harmful effects of the compounds disclosed by Resnick to the eye, a person skilled in the art would recognize that diffusion and migration of the MoS<sub>2</sub>, silver oxide, chromic oxide and ferric oxide should be avoided. Therefore, the reference teaches away from the claimed invention.

Still further, Resnick does not disclose or suggest selecting an encapsulation material for the nanoparticles that selected dependent upon ophthalmic drug characteristics wherein a hydrophobic encapsulation material is selected for a hydrophobic ophthalmic drug and a hydrophilic encapsulation material is selected for a hydrophilic ophthalmic drug or that his MoS<sub>2</sub>, silver oxide, chromic oxide and ferric oxide compounds are diffused into the eye so as to provide extended or time-release delivery of said compounds. For reasons set forth *supra*, none of the materials disclosed by Resnick would be considered by a person skilled in the art to be an ophthalmic drug. As evidenced by the MSDS's for the encapsulated compounds disclosed by Resnick (MoS<sub>2</sub>, silver oxide, chromic oxide and ferric oxide), these compounds would be deleterious to the eye.

The Neefe and Benz et al. patents do not make up for the deficiencies of Resnick. Neither reference discloses a contact lens containing nanospheres, let alone, nanospheres containing an ophthalmic drug.

Resnick does not anticipate claim 1 because the reference does not teach each and every element of the claimed invention, arranged as required by the claim, either expressly or under the principles of inherency, including the structure which is capable of performing the recited functional process limitations. *In re King*, 801 F.2d 1324, 1326-1327, 231 USPQ 136, 138 (Fed. Cir. 1986); *Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Co.*, 730 F.2d

1452, 1457, 221 USPQ 481, 485 (Fed. Cir. 1984). Since claims 2, 4, 5, 9, 12, and 13 are dependent on base claim 1, these claims would also not be anticipated by Resnick.

As for the rejections under 35 U.S.C. § 103(a), the teachings of Resnick do not render claim 10, 11, 14 and 15 obvious. The arguments set forth *supra* with respect to the rejection of claims 1, 2, 4, 5, 9, 12 and 13 as being anticipated by Resnick are incorporated herein by reference.

Each of the claims rejected under 35 U.S.C. § 103(a) is dependent on base claim 1. As discussed *supra*, Resnick does not disclose each and every element in claim 1 and the Examiner has not presented any cogent reasoning as to how the missing elements recited claim 1 would have been obvious or inherent from the teachings of Resnick. In the absence of such reasoning, the rejections of claims 10 and 11 cannot be maintained.

Moreover, claims 14 and 15 are directed to an article of manufacture comprising packaging material and the ophthalmic drug delivery system as set forth in claim 1, and recite that the packaging material comprises a label which indicates that said ophthalmic drug delivery system can be used for ameliorating symptoms associated with pathologic conditions of the eye. As set forth *supra*, any diffusion and migration of the encapsulated reflective compounds disclosed by Resnick to the post-lens tear film of the eye would be harmful to the eye, and therefore, could not ameliorate symptoms associated with pathologic conditions of the eye.

The combined teachings of Resnick and Darougar et al and the combined teachings of Resnick and Raut do not render obvious claims 6 and 17-19 and claims 6 and 16, respectively. Neither Darougar nor Raut make up for the deficiencies of Resnick. Neither reference discloses or suggests nanoparticles containing an ophthalmic drug dispersed within the contact lens or a

suggestion that Resnick can be modified to include an ophthalmic drug encapsulated in nanoparticles.. Also neither reference discloses or suggests that the selection for the encapsulation material for the nanoparticles is dependent upon ophthalmic drug characteristics, i.e., a hydrophobic encapsulation material is selected for a hydrophobic ophthalmic drug and a hydrophilic encapsulation material is selected for a hydrophilic ophthalmic drug. Further, neither Darougar nor Raut disclose or suggest that the nanoencapsule must be a material from which an ophthalmic drug is capable of being diffused into and migrate through a contact lens into a post-lens tear film when the contact lens is placed on the eye, and that diffusion from nanoencapsulation provides extended or time-release delivery of the ophthalmic drug.

For all of the foregoing reasons, it is requested that the rejections under 35 U.S.C. § 102(e) and 103(a) be reconsidered and withdrawn.

### **Conclusion**

As set forth above as well as for the arguments set forth in the amendment filed August 15, 2008, it is submitted that the claims 1-21 satisfy the requirements of 35 U.S.C. § 112 and are patentable over the teachings of the prior art relied upon by the Examiner. Accordingly, favorable reconsideration of the claims is requested in light of the preceding amendments and remarks. Allowance of the claims is courteously solicited.

If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicant's attorney at the telephone number shown below.


To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due under 37 C.F.R. § 1.17 and due in



connection with the filing of this paper, including extension of time fees, to Deposit Account 501165 and please credit any excess fees to such deposit account.

Respectfully submitted,

MILES & STOCKBRIDGE, P.C.

A handwritten signature in black ink, appearing to read "Cameron K. Weiffenbach", with a long, sweeping horizontal line extending to the right.

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**Date: November 5, 2008**

## MSDS molybdenum disulfide

### General

**Synonyms:** molybdenum disulfide, molybdenum disulphide, molybdenum (IV) sulphide

**Molecular formula:** MoS<sub>2</sub>

**CAS No:** 1317-33-5

**EINECS No:** 215-263-9

### Physical data

**Appearance:** dark grey or black powder

**Melting point:** 1185 C but sublimes from around 500 C

**Boiling point:** NA

**Vapor density:** NA

**Vapor pressure:** NA

**Density (g cm<sup>-3</sup>):** 5.06

**Flash point:** NA

**Explosion limits:** NA

**Auto-ignition temperature:** NA

**Water solubility:** insoluble

**Spec Gravity:** 4.8

### Health Hazards Data

**LD50 LC50 Mixture:** PRODUCT'S LD50 (ORAL RAT)

**WAS NOT STATED**

**Route Of Entry- Inhalation:** YES

**Skin:** YES

**Ingestion:** NO

**Carcinogenicity - NTP:** NO

**IARC:** NO

**OSHA:** NO

**Effects of Exposure:** ACUTE: EXPOSURE MAY CAUSE EYE, SKIN AND RESPIRATORY

TRACT IRRITATION. INGESTION NOT STATED.

**CHRONIC:** NONE SPECIFIED

**Explanation Of Carcinogenicity:** NO INGREDIENT OF A CONCENTRATION OF 0.1% OR

GREATER IS LISTED AS A CARCINOGEN OR SUSPECTED CARCINOGEN.

**Signs And Symptoms Of Over exposure:** EYES: CAN CAUSE IRRITATION, REDNESS. SKIN:

PROLONGED CONTACT CAN CAUSE IRRITATION, DERMATITIS. INHALATION: CAN CAUSE IRRITATION.

**Medical Conditions Aggravated By Exposure:** NONE SPECIFIED

**First Aid:** SKN-WASH WITH SOAP AND WATER.

**EYES-FLUSH WITH LOTS OF WATER.**

**INHALED-REMOVE TO FRESH AIR. GET MEDICAL ATTENTION IF BREATHING IMPAIRED.**

**INGESTED-NONE STATED.**

### Handling and Disposal

**Spill Release Procedures:** CLEAN UP BY VACUUMING OR WET SWEEPING TO MINIMIZE

DUST EXPOSURE. PROVIDE CLEAN UP PERSONNEL WITH NIOSH APPROVED DUST RESPIRATORS.

**Neutralizing Agent:** NONE SPECIFIED BY MANUFACTURER.

**Waste Disposal Methods:** DISPOSE OF IN A CHEMICAL LANDFILL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL ENVIRONMENTAL REGULATIONS.

**Handling And Storage Precautions:** USE ADEQUATE VENTILATION TO MAINTAIN LEVELS BELOW TWA LIMITS.

**Other Precautions:** NONE.

### Fire and Explosion Hazard Information

**Extinguishing Media:** CARBON DIOXIDE, FOAM, DRY CHEMICAL, HALON.

**Fire Fighting Procedures:** NOT CONSIDERED A FIRE HAZARD AND DOES NOT SUPPORT COMBUSTION.

**Unusual Fire/Explosion Hazard:** NONE.

### Control Measures

**Respiratory Protection:** USE NIOSH APPROVED DUST, FUME AND; MIST RESPIRATOR IF

TWA/TLV LIMITS ARE EXCEEDED.

**Ventilation:** USE LOCAL EXHAUST AND MECHANICAL (GENERAL) AS NECESSARY TO MAINTAIN LEVELS BELOW TWA LIMITS.

**Protective Gloves:** NONE NORMALLY REQUIRED.

**Eye Protection:** WEAR SAFETY GLASSES OR GOGGLES.

**Other Protective Equipment:** NONE.

**Work Hygienic Practices:** DLA-WASH HANDS AFTER HANDLING AND BEFORE EATING, DRINKING, OR SMOKING. LAUNDER CONTAMINATED CLOTHES BEFORE REUSE.

### Reactivity Data

**Stability Indicator:** YES

**Stability Condition To Avoid:** NONE.

**Materials To Avoid:** STRONG OXIDIZING AGENTS SUCH AS HYDROGEN PEROXIDE.

**Hazardous Decomposition Products:** IRRITATING AND/OR TOXIC FUMES INCLUDING SULFUR OXIDES AND HYDROGEN SULFIDE MAY BE RELEASED.

**Hazardous Polymerization Indicator:** NO  
**Conditions To Avoid Polymerization:** WILL NOT OCCUR.

### Transportation Information

#### Detail DOT Information

**DOT PSN Code:** ZZZ

**DOT Proper Shipping Name:** NOT REGULATED BY THIS MODE OF TRANSPORTATION

#### Detail IMO Information

**IMO PSN Code:** ZZZ

**IMO Proper Shipping Name:** NOT REGULATED FOR THIS MODE OF TRANSPORTATION

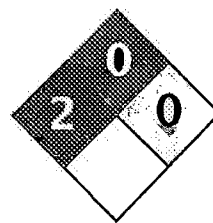
### Stability

**Stable.** Incompatible with oxidizing agents, acids.

**Bemol**

Rose Mill Co.  
Bemol Lubricants  
100 Brook Street  
West Hartford, CT 06110

[www.RoseMill.com](http://www.RoseMill.com)



Health	2
Fire	0
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Silver(I) oxide MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Silver(I) oxide

**Catalog Codes:** SLS3274

**CAS#:** 20667-12-3

**RTECS:** Not available.

**TSCA:** TSCA 8(b) inventory: Silver(I) oxide

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** Ag<sub>2</sub>O

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Silver(I) oxide	20667-12-3	100

**Toxicological Data on Ingredients:** Silver(I) oxide: ORAL (LD50): Acute: 2820 mg/kg [Rat]. 1027 mg/kg [Mouse].

### 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Oxidizing material.

Stop leak if without risk. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level

above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Keep away from combustible material Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

**Storage:** Oxidizing materials should be stored in a separate safety storage cabinet or room.

### Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.01 (mg/m<sup>3</sup>) from ACGIH  
Consult local authorities for acceptable exposure limits.

### Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 231.74 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not available.

**Boiling Point:** Not available.

**Melting Point:** Decomposes. (100°C or 212°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 7.22 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold water.

#### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

#### Section 11: Toxicological Information

**Routes of Entry:** Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 1027 mg/kg [Mouse].

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

#### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**  
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 5.1: Oxidizing material.

**Identification :** Oxidizing solid, n.o.s. (Silver oxide) ; UN1479 PG: III

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:** TSCA 8(b) inventory: Silver(I) oxide

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** CLASS C: Oxidizing material.

**DSCL (EEC):** R36/38- Irritating to eyes and skin.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

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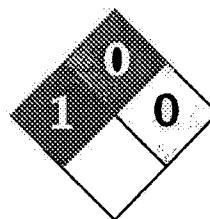
**Last Updated:** 10/09/2005 06:27 PM

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**Science Lab.com**  
Chemicals & Laboratory Equipment



Health	1
Fire	0
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Ferric oxide MSDS

### Section 1: Chemical Product and Company Identification

Product Name: Ferric oxide

Catalog Codes: SLF1657

CAS#: 1309-37-1

RTECS: N07400000

TSCA: TSCA 8(b) Inventory: Ferric oxide

CI#: Not available

Synonym:

Chemical Name: Not available.

Chemical Formula:  $\text{Fe}_2\text{O}_3$

Contact Information:

ScienceLab.com, Inc.

14025 Smith Rd.

Houston, Texas 77390

US Sales: 1-800-991-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

#### Composition:

Name	CAS #	% by Weight
Ferric oxide	1309-37-1	100

**Toxicological Data on Ingredients:** Ferric oxide LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

#### Potential Acute Health Effects:

Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.

#### Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance is toxic to lungs, mucous membranes.

Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:** No known effect on eye contact, rinse with water for a few minutes.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:** Not available.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:**

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:** No specific safety phrase has been found applicable for this product.

**Storage:**

No specific storage is required. Use shelves or cabinets sturdy enough to bear the weight of the chemicals. Be sure that it is not necessary to strain to reach materials, and that shelves are not overloaded.

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 5 (mg/m<sup>3</sup>) from ACGIH [1995]

Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 159.7 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** Decomposes.

**Melting Point:** 1565°C (2849°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 5.24 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

#### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

#### Section 11: Toxicological Information

**Routes of Entry:** Ingestion.

**Toxicity to Animals:**

LD50: Not available.

LC50: Not available.

**Chronic Effects on Humans:** The substance is toxic to lungs, mucous membranes.

**Other Toxic Effects on Humans:**

Hazardous in case of ingestion.

Slightly hazardous in case of skin contact (irritant), of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Not available.

#### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are as toxic as the original product.

**Special Remarks on the Products of Biodegradation:** Not available.

#### Section 13: Disposal Considerations

**Waste Disposal:**

#### Section 14: Transport Information

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Ferric oxide

Massachusetts RTK: Ferric oxide

TSCA 8(b) inventory: Ferric oxide

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

This product is not classified according to the EU regulations.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

**National Fire Protection Association (U.S.A.):**

**Health:** 1

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 05:32 PM

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**MATERIAL SAFETY DATA SHEET**  
**CHROMIC OXIDE**

**ELEMENTIS**

**CHROMIUM**

**1. PRODUCT AND COMPANY IDENTIFICATION**

**COMMON NAME:** Chromic Oxide  
**CHEMICAL NAME:** Metal Oxide  
**SYNONYMS:** G-4099, G-5099, G-6099, G-8599, G-112, G-120, M-100, GA-4090, GA-6090  
ACCROX R, ACCROX S, ACCROX C, Chromium Oxide Metallurgical  
**CHEMICAL FORMULA:**  $\text{Cr}_2\text{O}_3$   
**PRODUCT CAS NO.:** 1308-38-9 Chromic Oxide **RTECS:** GB6475000  
**COMPANY:** Elementis Chromium LP  
**ADDRESS:** 3800 Buddy Lawrence Drive  
PO Box 9912  
**CITY, STATE, ZIP:** Corpus Christi, TX 78469  
**PHONE:** (361) 880-7725 **FAX:** (361) 866-1462  
**EMERGENCY PHONE:** (361) 883-6421

**2. INGREDIENTS: COMPOSITION/INFORMATION**

INGREDIENT	WEIGHT %	PEL-OSHA	TLV-ACGIH	LD50/LC50 ROUTE/SPECIES
Chromic Oxide	> 98	0.5 mg/m <sup>3</sup> (Cr III Cpds.)	0.5 mg/m <sup>3</sup> (Cr III Cpds.)	No Data

**3. HAZARDS IDENTIFICATION**

**EMERGENCY OVERVIEW**

Odorless, nonflammable green powder which can cause skin, eye, and respiratory irritation. May have adverse effects if ingested. Long-term exposure may adversely affect the lungs. Avoid breathing dusts.



## ELEMENTIS CHROMIUM: MSDS FOR CHROMIC OXIDE

### 3. HAZARDS IDENTIFICATION (CONTINUED)

#### POTENTIAL HEALTH EFFECTS

PRIMARY ROUTE(S) OF ENTRY: Inhalation, ingestion, skin and eye contact

EYE: Contact with dusts may cause irritation or conjunctivitis.

SKIN: Contact may cause irritation and erythema. Repeated contact may cause dermatitis.

INGESTION: Ingestion may cause nausea, vomiting, and diarrhea.

INHALATION: Inhalation of dusts may irritate the nose, throat and upper respiratory tract.

CHRONIC: Long-term exposure may damage the lungs and respiratory tract.

TARGET ORGANS: Respiratory system, eyes, skin

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May exacerbate preexisting lung and skin conditions.

SIGNS AND SYMPTOMS: Dermatitis, general eye, skin, and respiratory irritation.

CARCINOGENICITY: IARC: No\* NTP: No OSHA: No

\* IARC considers chromium(III) compounds unclassifiable as to carcinogenicity to humans (Group 3).

### 4. FIRST AID MEASURES

EYE CONTACT: Flush eyes with large amounts of lukewarm water for 15 minutes. If irritation persists, seek medical attention.

SKIN CONTACT: Remove contaminated clothing and wash skin thoroughly with soap and water. If irritation persists, seek medical attention. Thoroughly clean contaminated clothes and shoes before reuse.

INHALATION: Remove to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Seek medical attention immediately.

OTHER: Adverse effects are not anticipated. If substantial ingestion occurs, seek medical attention.

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### 5. FIRE FIGHTING MEASURES

#### FLAMMABLE PROPERTIES

HMIS HAZARD CLASSIFICATION: HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

FLAMMABLE LIMITS: LEL: Not Applicable UEL: Not Applicable

EXTINGUISHING MEDIA: Use media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARDS: Fire conditions may produce small amounts of hexavalent chromium and other oxidation products.

FIRE FIGHTING EQUIPMENT: Firefighters should wear a NIOSH/MSHA-approved full-facepiece self-contained breathing apparatus (SCBA) operated in positive pressure mode and full turn out gear or bunker gear.

### 6. ACCIDENTAL RELEASE MEASURES

Isolate hazard area and deny entry to unauthorized and/or unprotected personnel. Clean up personnel should wear appropriate protective equipment including respiratory protection as necessary (See Section 8). Carefully shovel or sweep any spilled chromic oxide into a clean dry closed container. Dike spilled liquid material with suitable inert sorbent (i.e., sand, soil, vermiculite) and place in clean dry container for later recycle or disposal.

### 7. HANDLING AND STORAGE

Store away from incompatible materials. Keep containers closed when not in use. Wash hands thoroughly after handling, before leaving the work area, and before meals or breaks. Minimize dust creation. Remove any contaminated clothing and launder before re-use. Keep away from food.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

RESPIRATORY PROTECTION: MSHA/NIOSH - Approved filter type dust respirator in accordance with the requirements of 29 CFR 1910.134.

SKIN PROTECTION: Protective gloves should be worn to prevent skin contact.

## ELEMENTIS CHROMIUM: MSDS FOR CHROMIC OXIDE

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

EYE PROTECTION: Safety glasses or chemical safety goggles as necessary to prevent eye contact.

ENGINEERING CONTROLS: Local exhaust ventilation for procedures which generate dust.

PERSONNEL SAMPLING: Air sampling for chromium(III): Mixed cellulose ester filter, 0.8  $\mu$ m (NIOSH 7024).

OTHER: Emergency eyewash stations and safety showers should be readily available.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Green powder
ODOR:	Odorless
BOILING POINT:	4000 °C
VAPOR PRESSURE (mm Hg):	Not Applicable
VAPOR DENSITY (Air = 1):	Not Applicable
SOLUBILITY IN WATER:	Insoluble
SPECIFIC GRAVITY (H <sub>2</sub> O = 1)	5.1
MELTING POINT:	2266 °C
EVAPORATION RATE (H <sub>2</sub> O = 1):	Not Applicable
pH:	No Data
% VOLATILE:	Not Applicable

### 10. STABILITY AND REACTIVITY

STABILITY: Stable under normal conditions and use.

INCOMPATIBILITY: Chromic oxide may react with molten alkali at high temperatures under oxidizing conditions. May react with lithium, nitroalkanes, dirubidium acetylide, oxygen difluoride and other strong oxidizers. Reaction with chlorine trifluoride produces flame. Contact between glycerol and chromic oxide may produce an explosion.

HAZARDOUS DECOMPOSITION PRODUCTS: A small amount (less than 0.1% as Cr) may convert to hexavalent chromium if this product is exposed to elevated temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

## ELEMENTIS CHROMIUM: MSDS FOR CHROMIC OXIDE

### 11. TOXICOLOGICAL INFORMATION

Trivalent chromium has relatively low toxicity due to poor cell membrane permeability and noncorrosivity.

INGESTION: Chromic Oxide has no established oral toxicity.

SKIN: Dermatitis has been reported in workers handling trivalent chromium compounds.

EYE: No Data

INHALATION: No Data

CHRONIC: Preliminary study of 300 workers exposed for 20-25 years to Cr(III) as chromic oxide and chromic sulfate showed no differences from controls in respiratory illness and clinical or blood studies. Chromic oxide fed to rats in dosages up to 5% for two years produced no treatment related effects (NOEL).

SUBCHRONIC: No Data

### 12. ECOLOGICAL INFORMATION

FATE: Generally chromic oxide is removed from the atmosphere through wet and dry deposition. Chromic oxide particles < 20  $\mu\text{m}$  aerodynamic diameter may remain airborne for long periods and may be transported long distances. Chromic oxide is not expected to be transported from the troposphere to the stratosphere. Chromic oxide is expected to remain unchanged following release into soil. The predominant form of chromium in soil probably is as insoluble chromic oxide.

ECOTOXICITY: Bioaccumulation of chromium from soil to above ground parts of plants is unlikely. There is no indication of biomagnification of chromium along the terrestrial food chain (soil-plant-animal).

### 13. DISPOSAL CONSIDERATIONS

Product does not exceed the RCRA extraction procedure limit of 5 ppm for total soluble chromium as shipped from the manufacturer. Wastes from this product may or may not be classified as a hazardous waste. Chemical processing of this product (particularly at elevated temperatures) can cause chemical reactions which produce substances which will exceed the RCRA limit. Wastes from this product should be tested to determine the proper waste classification. Incineration is not recommended as some trivalent chromium may convert to the hexavalent form.

Recycle, reclaim and dispose of in accordance with applicable local, state, and federal regulations. Dispose per 40 CFR Part 261 and 262.

## ELEMENTIS CHROMIUM: MSDS FOR CHROMIC OXIDE

### 14. TRANSPORT INFORMATION

DOT CLASSIFICATION: Not classified

### 15. REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200: Product is hazardous under criteria of this rule.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Immediate Health Hazard  
Delayed Health Hazard

SARA 313 INFORMATION: Chromic oxide is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372 under the broad class of chromium compounds.

RESOURCE CONSERVATION AND RECOVERY (RCRA) ACT 40 CFR 261 SUBPART C: If this product becomes a waste, it may or may not be characterized as a hazardous waste (D007) as prescribed by the Resource Conservation and Recovery Act (RCRA) regulations.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT, 40 CFR Part 117, Part 304: Chromic oxide is a CERCLA hazardous substance included under the broad category of chromium compounds. No reportable quantity (RQ) has been listed for this broad class of compounds.

CLEAN AIR ACT (CAA): Chromium is designated as a hazardous air pollutant under Section 112 of the CAA.

CALIFORNIA PROPOSITION 65: Chromic Oxide is covered under Proposition 65 for hexavalent chromium. Appropriate warnings should be given.

## ELEMENTIS CHROMIUM: MSDS FOR CHROMIC OXIDE

### 16. OTHER INFORMATION

KEY:  
ACGIH: American Conference of Governmental Industrial Hygienists  
IARC: International Agency for Research on Cancer  
NIOSH: National Institute for Occupational Safety and Health  
NTP: National Toxicology Program  
MSHA: Mine Safety and Health Administration  
OSHA: Occupational Safety and Health Administration  
TLV: Threshold Limit Value  
PEL: Permissible Exposure Limit

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